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Geochemical Studies of Ground Water at the Eastern Side Dindigul Rock Fort due to the Impact of Sewage and Industrial Effluent

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Abstract

An attempt has been made to study the impact of untreated sewage water and industrial effluent in the ground water sources from the houses located at the foot hills of Dindigul Rock fort. The pond has become the collection of sewage water from Dindigul town. About 10 ponds in Dindigul town discharges through various canals and finally reaches the Rock fort pond behind Taluk Office. Hence the water in the pond as well as the ground water sources around the various residential area like Kamarajapuram, due to high degree of pollution many sources has to be abandoned ground water analysis at four different sites at four direction reveals that the water quality parameters are higher than the permitted level. As per CPHEEO standard specifically high turbidity, high TDS and higher electrical conductivity values indicates that the water cannot be used for human consumption or any other use. The adjoining ground water sources are mostly affected and the water becomes very salty with very high TDS. Hence the polluted water is suggested to water treatment using Reverse Osmosis System.

Keywords: *CPHEEO; Ground Water; Industry effluent; Sewage.*

1. INTRODUCTION

1.1 Water Pollution

Water pollution can be defined in many ways. Usually, it means one or more substances have built up in water to such an extent that they cause problems for animals or people. Oceans, lakes, rivers, and other inland waters can naturally clean up a certain amount of pollution by dispersing it harmlessly. If you poured a cup of black ink into a river, the ink would quickly disappear into the river's much larger volume of clean water. The ink would still be there in the river, but in such a low concentration that you would not be able to see it. At such low levels, the chemicals in the ink probably would not present any real problem. However, if you poured gallons of ink into a river every few seconds through a pipe, the river would quickly turn black. The chemicals in the ink could very quickly have an effect on the quality of the water. This, in turn, could affect the health of all the plants, animals, and humans whose lives depend on the river.

1.2 Sewage

With billions of people on the planet, disposing of sewage waste is a major problem. According to 2004 figures from the World Health Organization, some 1.1 billion people (16 percent of the world's population)

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don't have access to safe drinking water, while 2.6 billion (40 percent of the world's population) don't have proper sanitation (hygienic toilet facilities); the position hasn't improved much since. Sewage disposal affects people's immediate environments and leads to water-related illnesses such as diarrhea that kills 3-4 million children each year. (According to the World Health Organization, water-related diseases could kill 135 million people by 2020.) In developed countries, most people have flush toilets that take sewage waste quickly and hygienically away from their homes.

Effluent irrigation has been practiced for centuries throughout the world (Shuval *et al*. 1986; Tripathi *et al*. 2011). It provides farmers with a nutrient enriched water supply and society with a reliable and inexpensive system for wastewater treatment and disposal (Feigin *et al*. 1991). In India also being a cheap source of irrigation . Rapid industrialization, population explosion and more urbanization in India have created enormous problems of environmental pollution in terms of generating the variable quantity and quality of solid and liquid wastes. In developing countries, there has not been much emphasis on the installation of sewage treatment plants and all the industrial effluents are generally discharged in to the sewage system. The sewage waters are used as potential source irrigation for raising vegetables and fodder crops around the sewage disposal sites which are directly or indirectly consumed by human beings.

Soil contamination by sewage and industrial effluents has affected adversely both soil health and crop productivity. Sewage and industrial effluents are the rich sources of both beneficial as well as harmful elements. Since some of these effluents are a rich source of plant nutrients, therefore soil provides the logical sink for their disposal. But many untreated and contaminated sewage and industrial effluents may have high concentration of several heavy metals such as Cd, Ni,Pb and Cr (Arora *et al.* 1985). Their continuous disposal on agricultural soils has resulted in soil sickness (Narwal *et al.* 1988) and accumulation of some of the toxic metals in soil (Adhikari *et al*. 1993; Antil, 2005; Gupta *et al.* 2002, 1998; Kharche *et al.* 2011) which may pose serious human and animal health. Ground water in Punjab has been contaminated by Hg and Pb to such an extent that it is causing DNA of the people, who drink it, to mutate (Bajwa, 2008). The present chapter, therefore, discusses the composition of sewage and industrial effluents in India and their possible effect on soil-plant health.

Over two thirds of Earth's surface is covered by water; less than a third is taken up by land. As Earth's population continues to grow, people are putting ever-increasing pressure on the planet's water resources. In a sense, our oceans, rivers, and other inland waters are being "squeezed" by human activities—not so they take up less room, but so their quality is reduced. Poorer water quality means water pollution.

2. SCOPE AND OBJECTIVES OF THE STUDY

The volume of sewage water discharged from the house in dindigul town through nine ponds are increasing day by day finally the sewage water is collected at the foot of the Rock fort in a pond, similarly the industrial waste water from dyeing units and other small scale industries.The sewage water and the industries effluent from the canals discharged the polluted water in to the pond without any treatment.The option of treatment plant to treat the sewage water and the effluent may lead to spoilage of environment one time morning people will not be able to get good quality of drinking water from the ground water in and around the Dindigul Rock fort area. The environmental damage caused by water pollution by the discharge of sewage water and industrial effluent in the pound at foot hills of Dindigul Rock fort.

2.1 Objectives

- To evaluate the physic chemical parameters of the water in the pond at the foot hills of Dindigul Rock fort.

- To evaluate the physic chemical parameter of the ground water present in the well and bore wells around the pound located at the foot hills of Dindigul Rock fort.
- To suggest a suitable remedial measure to treat the groundwater using RO system.

3. MATERIALS & METHODS

The pond located at the foot hills of Dindigul Rock fort has become the collection of sewage water and industrial effluent from the Dindigul town due to slop and gradient all the sewage water from 10 pounds in Dindigul town reaches the rock fort pond on the Northern side of Dindigul Rock fort.Hence the water in the pond as well as the ground water sources in and around the Rock fort area at a radius of 2 km are completely polluted due to the continuous discharge and percolations of the sewage water to the ground water.

The absence of any organized and sewage and industrial effluent systems and the sewage treatment plant in dindigul town, the community wastes often find their way to the nearby lake, pond and river. During the rainy seasons almost all the 10 ponds located in Dindigul at different area in all the four direction discharge the sewage water through big canals and finally reach the pond at the foot hills of the Rock fort which leads to the ground water pollution at a radius of 5 km around the Rock fort. The rain water which percolates in to the ground is the main source of water to the located in the residential areas like Kamarajapuram, sannieswaran kovil and sreenivasaperumal kovil are located at the bottom of the Rock fort are very much affected. During survey people in the residential area are not using the ground water due to high salty taste with high turbity.

3.1 Analysis of the Contaminated Water

S.No	Parameter	Method Of Analysis
1	Colour	Visual comparison
2	Turbidity	Neplo turbidity meter
3	TDS	Conductivity method
4	Electrical conductivity	Conductivity meter
5	pH	pH Meter
6	Total hardness	EDTA Titrimetric method
7	Calcium	EDTA Titrimetric method
8	Magnesium	Calculation from Total Hardness
9	Iron	Spectrophotometer
10	Ammonia	Nessler's Method
11	Nitrite	Spectrophotometer
12	Nitrate	Spectrophotometer
13	Chloride	Silver nitrate
14	Fluoride	Colorimetric meter
15	Sulphate	Turbidity method
16	Phosphate	Spectrophotometer

4. RESULTS & DISCUSSIONS

4.1 Drinking Water Standards

Raw water quality and standards depends upon the end use. The four main uses are municipal, industrial, agricultural and recreational (fish and wildlife). As water quality is degraded day by day, so, it become very important to set the drinking water standards for the safety of water of our limited resources. Different agencies have set environment standards for safe drinking water like Bureau of Indian Standards (BIS), World Health Organization (WHO), and European Economic Community (EEC) etc. Drinking water standards are regulation that Bureau of Indian Standards (BIS) set to control the level of contamination in the drinking water. Bureau of Indian Standard consider the inputs from many organization i.e. Central, State,

4.1. ComprehensiveTable Water Quality Analysis

Sample collection	BIS Limit	S1	S2	S3	S4
Appearance		Turbid	Clear	Clear	Clear
colour(Pt.Co-Scale)	5	Blackish	Colourless	Colourless	Colourless
Turbidity NT units	5	60	7	6	3
Total dissolved solids mg/L	500	1409	808	904	653
Electrical conductivity in Micro mhos/cm		2072	1189	1329	960
P^H	7.0-8.5	7.49	7.69	8.03	7.63
Total hardness as $CaCO_3$ (mg/L)	300	700	268	340	272
Calcium as Ca mg/L	75	144	64	74	61
Magnesium as Mg mg/L	30	82	26	37	29
Sodium as Na	_	120	124	112	78
Potassium as K	_	30	32	28	20
Iron as Fe mg/L	0.3	4.31	1.02	0.59	0.86
Ammonia as NH_3 mg/L	_	5.34	1.09	0.76	0.59
Nitrite as NO_2 mg/L	_	0.73	0.33	0.22	0.16
Nitrate as NO_3 mg/L	45	16	13	6	5
Chloride as Cl mg/L	250	440	176	224	162
Fluoride as F mg/L	1	1.2	0.4	0.8	0.4
Sulphate as SO_4mg/L	200	117	116	76	62
Phosphate as PO_4 mg/L	_	2.50	0.90	0.72	0.63

Semi Government, Municipal Corporation, Public Health Organization, etc., throughout the standard setting process.

4.2. Sensitive Parameters

Parameters like TDS, EC, hardness, calcium, magnesium, Iron, fluoride and Sulphate are taken as sensitive parameters to indicate the water pollution by industrial effluent from various sources. It is observed that the values are higher compared the BIS Standards.

5. CONCLUSION

An attempt has been made to study the impact of untreated sewage water and industrial effluent in the

ground water sources from the houses located at the foot hills of Dindigul Rock fort. The pond has become the collection of sewage water from Dindigul town About 10 ponds in Dindigul town discharges through various canals and finally reaches the Rock fort pond behind Taluk Office. Hence the water in the pond as well as the ground water sources around the various residential area like Kamarajapuram, due to high degree of pollution many sources has to be abandoned ground water analysis at four different sites at four direction reveals that the water quality parameters are higher than the permitted level. As per CPHEEO standard specifically high turbidity high TDS and higher Electrical conductivity values indicates that the water cannot be used for human consumption or any other use. People have to depend only on municipal water sources from Authoor, For other uses the ground water can be treated using RO system.The adjoining ground water sources are mostly affected and the water becomes very salty with very high TDS.Hence the polluted water is suggested to water treatment using Reverse Osmosis System.

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